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TRANSPORTATION RESEARCH TRANSEARCH

A RESEARCH AND DEVELOPMENT TECHNICAL PUBLICATION

SEP 20 1991

C-SHRP IMPLEMENTATION

by Jan Konarzewski

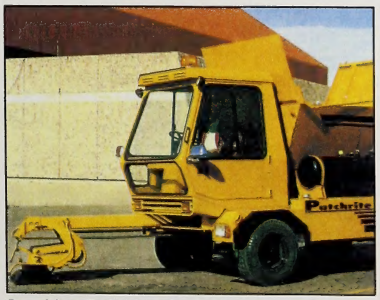
The Canadian Strategic Highway Research Program (C-SHRP) is now into the fifth year of its seven-year life, while the United States Strategic Highway Research Program (SHRP) is in the fifth year of its six-year life. Research has been actively pursued in both programs in Asphalts, Long Term Pavement Performance, Concrete & Structures and in Operations. The two programs will respectively cost $5.6M and $150M U.S. in direct costs, without considering agency contributions in kind, which have been substantial. The research will be completed by the end of the programs - and then what? Research results that are not transferred to the practitioners in the field, have little value! Behind the scenes there has been a lot of activity in trying to devise methods to transfer the results of both programs to the practitioners across Canada. Although not complete as yet, they are receiving high priority and hope to be implemented in the not too distant future. Not too soon at that! As the accompanying photographs show (courtesy of SHRP) real products are starting to emerge from the programs and are ready for field trials, implementation and eventual adoption into normal agency practices and operations.

SHRP IDEA Project – work zone safety unit protects worker during routine highway maintenance operations.

SHRP is expecting some 94 products to emerge from its program, and including C-SHRP, we will have over 100 products to transfer and implement. Not a small undertaking, but one which we cannot afford not to do!

The SHRP products in the main can be categorized as: Equipment (11); Materials (9); Specifications (33); Test Methods (26); Computer Software (2); Manuals (10); Training Aids (1) and Other (2). It is estimated that widespread adoption in the U.S.A. of nineteen of these products would save more than $500M U.S. per year, over current methods and practices. We in Canada and Alberta can also benefit proportionally by implementing these research results. Implementation is not an easy task. We in C-SHRP see it as a three-stage

Continued on Page 3



One Man Patching Operation

"SHRP & C-SHRP PRODUCTS"

For more on various products to emerge from these two programs, see page 3 of this issue.

Easy to handle Jersey Barriers are made from high strength plastics.

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This publication is printed on recycled paper

Research & Development Tech Transfer Workshop — Editorial

If you weren't there you missed a good one. The R&D Branch held it's first technology transfer workshop in Calgary in February. Approximately eighty staff from AT&U attended and one visitor all the way from Ontario.

The workshop consisted of presentations by district staff, and R&D staff on a variety of innovative developments. The topics ranged from products that could be readily applied and improve existing operations in the field, to more high level technologies that are currently under development, and are sure to have global impact on the transportation industry. Our guest visitor from Ontario also gave presentations on the state of Research and Technology Transfer in Ontario's Ministry of Transportation.

The participants also had the opportunity to raise many research and technology related issues during the breakout session on the second day of the workshop. Thirty nine issues were brought to light. A few were timely enough to make it into the R&D Annual Research Plan for this year. A few will be addressed in the plan next year.

Some issues fell outside of the R&D mandate, thus, they were directed to areas of the Department that could best handle the subject. And, a few issues have been addressed in the past by either R&D or another area of the Department. Most of the available information regarding these issues has been forwarded to the Technology Transfer Representatives.

Based on the success of this workshop, we plan to hold another in January or February, 1992 and look forward to more presentations from field staff. As you go about your daily activities perhaps you will come across some process, method, gadget, etc., that is worth transferring across the Department at the next workshop.

About This Publication

The **TRANSEARCH** quarterly publication is prepared by the Research and Development Branch of Alberta Transportation and Utilities. The publication is dedicated to the effective transfer of transportation and utilities related research information and state-of-the-art technologies throughout the department. The opinions expressed in the articles in this publication are those of the authors and are not necessarily the official views of Alberta Transportation and Utilities.

In short news and feature articles, **TRANSEARCH** reports on the most interesting research and technologically significant events concerning the department.

In the interest of providing a vehicle for the effective transfer of technology throughout the department, Research and Development encourages department staff to provide proposals containing unique ideas, innovations or opportunities for research and evaluation which may provide solutions to the various technical needs of the department.

This publication is distributed throughout the department of Alberta Transportation and Utilities. Back issues are catalogued and retained in the department library. Copies of **TRANSEARCH** are also distributed to other Canadian D.O.T.s as well as Alberta Cities.

Comments and suggestions may be submitted to:

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Edmonton, Alberta, T6B 2X3

Phone: (403) 422-2750

C-SHRP (continued from page 1)

One Man Patching Unit - Asphalt is delivered by conveyor to the exact location.

All functions including tamping are controlled from inside the operator's cab.

process:

Awareness:

This is the stage where products are defined as they emerge and potential benefits and limitations are identified. Likewise, a large audience of practitioners is identified for distribution of summary information on each product.

Assessments:

During this stage experts in the field where the product may be implemented assess if the research results are technically sound and what barriers might exist to implementation e.g. reluctance to change; prohibitive costs; vested interest; fear of the unknown, etc. How do we overcome these barriers? Do we need field trials, demonstrations, training, audio-visual aids, promotional equipment, workshops, seminars, adoption by standard setting organizations, etc.?

Delivery:

This is the final stage. Having decided what is needed we now have to move the product information right into the hands of the practitioners. Implementation packages must be tailored to each research finding and each audience group. Costs are not trivial! The Federal Highway Administration reports that the development of a one-week training course costs $350,000 U.S. Demonstrations or field trials could cost $30,000 to $500,000 depending on the complexity and distribution required. A video tape, a very good and effective medium which can be easily reproduced and distributed, costs approximately $1000 per minute for the production of the original tape.

So the research of the largest highway research program ever is starting to sunset, but the implementation of that research is yet to start. Can we afford not to implement the knowledge that has been gained? Not to muster the resources for this phase that will generate the real payback? I think not!

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ANTIFREEZE RECYCLING

by Peter Ing — R&D Roadway Engineering and Equipment Section

Ever wonder what happens to all the used antifreeze from our department's equipment and fleet vehicles? Until recently, the disposal of used antifreeze has been a problem. AT & U's annual expenditures for antifreeze for the department fleet can be as much as $100,000. Product that is removed for disposal would go to the Swan Hills' hazardous waste facility.

In response to rising public concern for the environment and the impetus to recycle whenever possible, a Calgary based firm, Antifreeze Recycling Ltd., now offers an antifreeze recycling service, using the "GLYCLEAN Antifreeze Recycling System".

This system uses the continuous steps of filtration and aeration/oxidation to remove contaminants in the antifreeze. GLYCLEAN additives or inhibitors, which prohibit rust and retard antifreeze degradation, are added in measured amounts based on the pH of the solution being recycled. Depending on the concentration of suspended particles, a 45 gallon barrel of used antifreeze requires 45 minutes to an hour of recycling time.

For our generally colder winter, undiluted 100 % antifreeze can be added to the mixture to achieve the desired -45 degree celsius operation requirement. In warmer climates, water can be added to dilute the solution without diminishing its performance.

Last fall, Central Services Facility at Airdrie and Research and Development Branch combined to test the recycling process to confirm its effectiveness in removing unwanted particulates from used antifreeze and to verify its performance in winter conditions as well as its long term effectiveness.

Several 45 gallon drums of used antifreeze were collected and recycled. Lab tests have already confirmed that the recycled material actually can exceed typical virgin antifreeze stock, in terms of particulates removed. The recycled product has now been distributed to fleet vehicles and equip-

Continued on next page

Antifreeze *(continued from page 3)*

ment for field testing. CSF Airdrie will be closely monitoring its performance over the next year.

If all proves well, a program for recycling as much of the used antifreeze as possible can be initiated. The advantages will be in reducing hazardous waste disposal and conserving raw ethylene material. In terms of cost, antifreeze prepared from the recycling process, in this test, actually was equivalent to the purchase price of virgin mixed material. Pickup and distribution costs for the recycling program are also comparable to savings in disposal costs.

Full credit to CSF Airdrie for their efforts in this project, as well as to those districts currently participating in the field tests.

In promoting environmental responsibility, I would heartily encourage everyone to continue their recycling initiatives and practices. Remember, every little bit helps!

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ORGANIC DE-TARRING SOLVENTS

by Mark Abt — R&D Roadway Engineering and Equipment Section

Everyone is concerned about the environment and what we can do to minimize the effect we have on it. The Research and Development Branch was recently approached by several personnel within Alberta Transportation and Utilities to assist in evaluating the performance of environmentally friendly Organic Solvents that are used to remove tar deposits from their equipment.

Organic De-Tarring Solvents are environmentally friendly because they are fully Bio-Degradable. This type of product lends itself well to Alberta Transportation's initiative to employ environmentally benign products whenever possible.

The Research and Development Branch contacted vendors previously identified as suppliers of organic solvents and offered them the opportunity to submit products which they considered to be effective against persistent tar deposits. A very favourable response from the vendors was received and a test structure for the products was formulated.

The test structure was designed to emulate as closely as possible real world conditions under which the organic de-tarring solvents would be expected to perform. The offending compound chosen to be the test deposit for removal was emulsion tack coat. This compound is commonly found on Alberta Transportation equipment as it is a liquid upon application and then hardens over time with exposure to air. Emulsion tack coat also has notoriety as being one of the most difficult deposits to remove from equipment.

Test plates were prepared with an automotive finish the same as that found on fleet equipment and the emulsion tack coat was double coated on to them by immersion and allowed to harden. The tests were arranged to identify the characteristics of the solvents under test. Properties of note were solvent/tar solubility, application time window, solvent viscosity and possible paint damage. Ten organic de-tarring solvents were tested, with several products identified as being successful at removing the emulsion tack coat deposit.

The objective of the tests was to identify a range of products that are effective against stubborn residues requiring removal from fleet equipment. We have found the results of the tests to be very encouraging as many products were successful in removing the test deposits and the benefits to the environment are legitimate.

It is hoped that AT&U personnel will find the recommended products that the report identifies useful in maintaining their equipment.

Please do not hesitate to contact the Research and Development Branch for a copy of Organic De-tarring Solvent Evaluations (ABTR/RD/TM-91/02).

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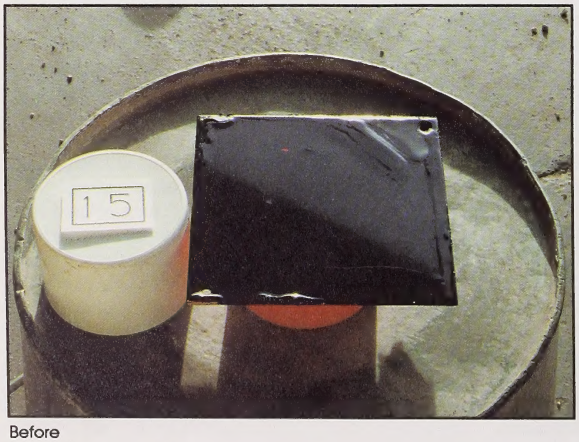
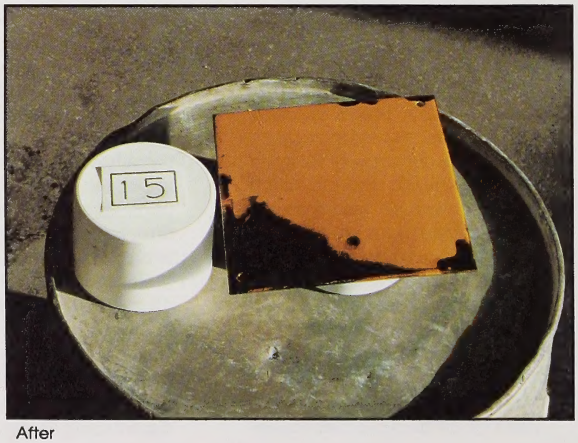


Before



After

SHOULD WE, OR SHOULDN'T WE? ONLY TIME WILL TELL

by Marcel Chichak — R&D Materials and Operations Section

There comes a time when you have to step back from what you're doing and take a good long look at just exactly why you do the things you do, and see if there is any way that it can be done more efficiently. This is particulary true in times of fiscal restraint, when we all have to do more with less. The Materials and Operations Section of the Research and Development Branch is in the business of reviewing, not only new products and procedures, but also well established and traditional materials and procedures.

One such review is looking at cracksealing. Sure we're looking at polymer modified asphalt cracksealers, lots of them. Sure we're looking at routing cracks prior to sealing. Sure we're looking at preheating cracks to improve sealer adhesion. But exactly why are we sealing cracks on our paved highways in the first place? Because we've always done it? Instinctively we have the feeling that by not cracksealing the ride quality will be degraded and the life span of the pavement will be shortened. But how much will the quality be degraded and how much will the life span be shortened? And the ultimate question: is it cost effective to crackseal annually, or budget for early pavement replacement instead?

A recent cross-Canada survey revealed that while all DOT's were concerned with the cost of cracksealing, and most were looking at materials and procedures which can effectively extend the life of the seals, no one had quantitative data as to what effects to expect from suspending cracksealing.

A side-by-side comparison of sealed and unsealed pavement, monitored over a period of many years, would demonstrate what effects suspending cracksealing would have, and would also provide valuable data for a cost/benefit analysis. In conjunction with the Regions, R&D branch has established just such a study at 22 sites throughout the province. Within these test sites three small adjacent sections have been established. They are either sealed annually or sealed every 4 years and a control section is left unsealed. The general layout of a test site is as shown in the photograph. Maintenance costs and pavement condition data collected at each site over the duration of the investigation will address the following questions:

Pavement marking at the start of a typical test site.

Type and rate of deterioration for each section;

Does annual cracksealing lengthen pavement life, and if so, how much;

How does the annual expense of cracksealing compare to earlier pavement rehabilitation cost;

Does periodic sealing net the same effect as annual sealing?

Twenty-two sites in a province the size of Alberta cannot be considered a representative statistical sample, but the sites do span the entire climatic range, various traffic loadings and pavement structures which should provide fairly representative data. Although it's already in its third year, three or four more years will be required before any significant change in pavement condition can be detected or quantified. Meanwhile, careful monitoring of the test sites through visual inspections and video logging of the pavement surface will continue to provide data toward a final analysis.

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WHAT AND WHO IS A TECHNOLOGY TRANSFER REPRESENTATIVE?

by Ray Filipiak - R&D Technology Transfer Section

The Technology Transfer Representative is the liaison person between Research and Development Branch and the branch, division or district office he or she represents. The Technology Transfer Representative is the initial contact for staff of the respective area of the Department with respect to technological improvement needs, innovations or ideas which can improve operations within the Department. The Technology Transfer Representative's responsibilities include the following:

- identifying technical improvement needs in the representative's area and advising Research and Development;
- providing ideas for potential solutions to existing problems;
- advising and delivering technical information to specific targets within the representative's area;
- promoting the technology transfer process;
- responding to inquiries on what R&D does or can do for the area represented;
- coordinating demonstration and presentations.

Each Technology Transfer Representative is also charged with the responsibility of promoting and sharing innovation within their own areas.

What Is A Transferable Technology?

A "Transferrable Technology" is any method, process, material or piece of equipment that can improve the efficiency, cost effectiveness and quality of an end product resulting from the operations performed by the Department. Any current Departmental operational problem in need of a solution can be considerred a "Technological Improvement Need". As far as what constitutes a viable transferable technology there is no difference between "High-Tech" and "Low-Tech". Priority is usually assigned to the technology which has the highest potential payback and is subject to available resources for proper transfer. A transferrable technology does not necessarily have to be a new or leading-edge technology either.

Innovation/Idea/Improvement Need Submission

The submission of an innovation, idea, or improvement need can be done in a number of ways including writing, phoning or meeting with either the Technology Transfer Representative or Research and Development personnel. All submissions should include the following critical information:

- Name of author (source of submission);
- Contact telephone number;
- District;
- Date of Submission;
- Idea description (one page or less, if possible);
- Attachments (supporting information such as photos, slides, video footage, samples, brochures, photocopies of magazine articles, etc.)

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Technology Transfer Representatives - Head Office

TT REP NAME	TITLE	AFFILIATION	PHONE #	RITE #	FAX #
Dave Quapp	Supr., Bridge Design Eng.	Bridge Engineering	427-6915	7-6915	
Ian Baird	Contract Admin. Eng.	Contracts Engineering	427-2097	7-2094	422-2822
Mike Olynik	Utilities Eng.	Design Engineering	427-3177	7-3177	422-2846
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Jane Stoeck *	Surfacing Design Eng.	Materials Engineering	427-3101	7-3101	
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Harry Parenteau	Mgr., Eng. & Procurement	Equip. Sup./Services	427-8310	7-8775	
Rick Orthner*	Systems Proj. Manager	Information Services	427-8690	7-8690	
Liz Owens	Research Officer	Motor Transp. Services	427-2059	7-5184	
Gerry Flynn	Manager, Photo Eng.	Roadway Planning	427-7073	7-7065	
Vacant		Property Services	427-3132	7-3132	427-1066
Frank Perich	Asst. Director	Traffic Engineering	427-6720		
Ryan Tajcnar	Strategic Planner	Policy Development	427-7944	7-7944	
Fred Bowker	Municipal Eng. Tech.	Municipal Branch	422-4591	7-4591	

Contact Person

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Tim Hawnt	Resident Engineer	District 2	381-5480	181-5480	
Ivan Perich	Asst. Dist. Trans. Eng.	District 3	854-5550	165-5550	
Fred Lee	Resident Eng.	District 4	297-7677	161-6311	
Khalid Choudhary	Resident Eng.	District 5	742-7577	153-7577	742-1341
Ed Spetter	Project Manager	District 6	340-7711	151-5576	
John Matwychuk	Res. Inspection Eng.	District 7	963-5711		
Roger Oberg	District Trans. Eng.	District 8	723-8250	130-1165	
Howard Peterson	Tech. Info. Coordinator	District 9	675-2624		
Gerry Pyper	Asst. Dis. Trans. Eng.	District 10	853-8178	141-1178	853-8210
Terry Colosimo	Resident Engineer	District 11	623-5256	137-1250	
Philip Luchka	Resident Engineer	District 12	523-6620	122-6620	
Garry Stone	Asst. Dis. Trans. Eng.	District 13	538-5310	121-5310	
K.P. Smith	Asst. Dis. Trans. Eng.	District 14	624-6130	120-6130	
Darrell Quist	Asst. Dist. Trans. Eng.	District 15	926-2241		

1991 EXPERT SYSTEM INFUSION PROJECT

by Zach Zacharia — R&D Technology Transfer Section

Research and Development Branch in conjunction with Information Systems Branch has developed a 2 year program to broadly introduce and gain acceptance of expert system technology in Alberta Transportation and Utilities. The primary benefits of developing expert systems will include:

1) Providing greater access for department personnel to expert system technology;
2) Encouraging a greater number of **user** developed expert systems;
3) Retaining expert system development expertise within the branches;
4) Retaining expertise that could be lost through retirement;
5) Duplicating an experts knowledge in many different locations of the department;
6) Providing senior expertise to junior staff.
7) Providing consistent designs and evaluations throughout the department;
8) Providing a more effective instruction module for training purposes.
9) Achieving the tremendous cost savings that are possible with expert systems.

Several branches in the the department were asked if they were interested in participating in the first round of an expert system research project with Research and Development Branch and Information System Branch. Each participating branch had to provide the following:

1) a suitable expert system project.
2) a knowledge engineer to work in the ISB boardroom from May to September.
3) an available expert for approximately 10 working days for the project.
4) a 386 computer for the knowledge engineer.
5) some pooled funds for expert system courses and consulting services.

Bridge Branch, Design Engineering Branch and Equipment Supply and Services Branch agreed to participate directly.

Expert System Projects

Bridge Engineering Branch is involved in two expert system projects. Culvert Repair Evaluation System is being developed by Byron Chelak and the domain expert is Clive Clarke. This system will determine the best repair procedure for metal culverts. Welding Approval Procedures is being developed by Tsighereda Alemayo and the domain expert is Wil Hamilton. This system will determine the validity of different welding procedures for different bridge structures.

Design Engineering Branch is involved in developing an Access Management Expert System. The knowledge engineer is Hal Cook and the domain expert is Alan Kwan. This system will determine the proper type of access road required off a highway given certain constraints.

Equipment Supply and Services Branch is involved in developing an Optimum Manpower Equipment Ratio Expert System. The Knowledge Engineer is Rod Jasman and the expertise is based on a committee from Shop Operations. This system will primarily focus on how to staff a repair shop taking into account the type of equipment to service, environmental conditions and the availability of private resources.

The expert system infusion project started with courses on expert systems which were held in Twin Atria May 13 - May 24. These courses ranged from a two hour management seminar open to all interested personnel to an intensive hands on 3 day course on using an expert system shell called 1st Class, which was open only to the project participants.

Each of the four expert system projects will be completed by October 31, 1991. The projects will then be evaluated by branch members who are not directly participating in the development of the prototypes to ensure the goals and objectives of each expert system prototype are met. These prototypes will be demonstrated to other branches to increase awareness and understanding of expert system technology. From November, 1991 to March, 1992 the rest of the departmental branches will be approached for new ideas for expert system development. A new set of projects will then be developed by branch users from April, 1992 to October, 1992 using the same format as before. Depending on departmental interest, staff availability and budgetary constraints, another set of projects may be developed by district end users from November, 1992 to March, 1993.

Further information on this project can be obtained by contacting the project coordinators Zach Zacharia at 422-2750 or Vern Kennedy at 427-8690.

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EASY LINE

Are you tired of spending, what seems to be, the whole day hunched over painting lines or markings on the road? Well, relief for your back is available and its not Absorbine Jr. There are several portable line painting devices available which offer ease of use, relatively inexpensive operation, and best of all a healthy back.

Portable line painting systems are very versatile and could be used in almost any situation where crisp straight lines are required as temporary or permanent markings. The spray width can normally be adjusted between 50 - 100 mm and the paint is avialable in several different colors including highway yellow and white. For more information regarding portable painting systems, contact Robert Powers at 422-2750.

SHRP PUBLICATIONS

1) **SHRP A UIR 90009** - Absorption of Asphalt Into Porous Aggregates
2) **SHRP 01 1989** - Concrete and Structures: Progress and Products Update
3) **SHRP A FR 91102** - Current Refining Practices For Paving Asphalt Production
4) **SHRP LTPP FR 90001** - Distress Identification Manual for the Long-term Pavement Performance Studies
5) **SHRP S FR 90002** - Electrochemical Chloride Removal and Protection of Concrete Bridge Components: Injection of Synergistic Corrosion Inhibitors
6) **SHRP W IR 90001** - Evaluation Procedures for Deicing Chemicals Interim Report
7) **SHRP A WP 89001** - Experimental Design Guidelines for SHRP Asphalt Research Contractors
8) **SHRP C FR 91101** - Handbook for the Identification of Alkali-Silica Reactivity in Highway Structures
9) **SHRP C FR 91103** - High Performance Concretes: A State-of-the-art Report
10) **SHRP C WP 90001** - High Performance Concretes: An Annotated Bibliography, 1974-1989
11) **SHRP A WP 90008** - Hypotheses and Models Employed in the SHRP Asphalt Research Program
12) **SHRP ID FR 90001** - Image Processing for a Pavement Crack Monitor
13) **SHRP A UIR 90016** - A Literature Review of Liquid Antistripping Agents, Mineral Additives and Tests for Measuring Stripping
14) **SHRP A IR 90014** - A Literature Review of the Absorption of Asphalt Functionalities on Aggregate Surfaces
15) **SHRP 02 1991** - Long-term Pavement Performance Information Management System Researchers Guide
16) **SHRP M FR 89001** - Maintenance Work Zone Safety
17) **SHRP G WP 90001** - Making the Most of the Second Half of SHRP (Strategic Highway Research Program): Proceedings of the SHRP Midcourse Assessment Meeting
18) **SHRP A UWP 90007** - The SHRP Asphalt Research Program: 1990 Strategic Planning Document
19) **SHRP A IR 89002** - SHRP Materials Reference Library Asphalt Selection Process: Improved Asphaltic Materials Experiment Design, Coordination, and Control of Experimental Materials
20) **AS 2 A5 S873 1987-88** - Strategic Highway Research Program Annual Report 1987-88
21) **TE 192 S7 1988** - Strategic Highway Research Program Second Annual Work Program, FY 1989, July 1, 1988 to June 30, 1989
22) **SHRP A IR 89004** - Summary Report on Aging of Asphalt-Aggregate Systems
23) **SHRP A IR 90015** - Summary Report on Asphalt Properties and Relationship to Pavement Performance: Literature Review
24) **SHRP A IR 90011** - Summary Report on Fatigue Response of Asphalt Mixtures
25) **SHRP A IR 90001** - Summary Report on Low Temperature and Thermal Fatigue Cracking
26) **SHRP A IR 89003** - Summary Report on Water Sensitivity
27) **SHRP A IR 91104** - Summary Report on Permanent Deformation in Asphalt Concrete

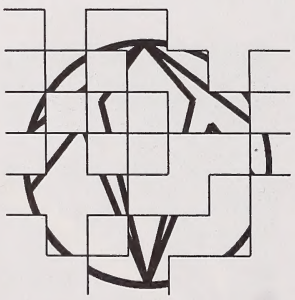
RECENT R&D PUBLICATIONS

ABTR/RD/TM-91/01
"BIOSOL" Organic Fertilizer for Revegetation of Adverse Sites
Author: Alan Mah

ABTR/RD/TM-90/07
Methods of Detecting Moisture Content in Bridge Decks
Author: Marcel Chichak

ABTR/RD/TM-90/06
Evaluation of PYPRR Degreaser/Cleaner
Author: Brian Hunter

ABTR/RD/RR-91/03
Erosion Control Blankets for Soil Stabilization & Revegetation
Author: Alan Mah

ATTENTION CITIES, COUNTIES, MD's and OTHER MUNICIPALITIES!!!

These reports are available for loan from the Alberta Transportation & Utilities Library. For a personal copy of any of the above reports, contact the Transportation Research Board, 2101 Constitution Avenue N.W., Washington, D.C., U.S.A., 20418, (202)334-2972.